EPIDEMIOLOGY OF CANCER

Prof. Dr. Maha Al- Nuaimi

Objectives

- To identify the distribution of cancer and trends of its occurrence.
- To illuminate its risk factors and determinants.
- To clarify the prevention policies against such problem.

Importance of this lecture?

- Cancer is the second leading cause of death worldwide ??
- Responsible for nearly 1 in 6 deaths globally.
- Understanding epidemiology helps in prevention, early detection, and policy-making.

WHAT IS CANCER ?

- ***Uncontrollable Growth of any of body's cells.***
- ***Caused by mutations to the DNA within cells.***

The major categories of cancer are:

- Carcinomas
- Sarcomas
- Leukemia
- Lymphomas.

Which is the commonest type??

Global impact of cancer

In 2023 …. GLOBALY….

- 20 million New cancer cases/year.
- Predicted to be about 35 million/yr.. By 2050,
- Male affected more than female.
- 9.7 million/yr CA deaths.
- 60% of all *New CA and 70% deaths* was in Asia, Africa, SA.

WHY??

- The higher CA incidence rates:

Lung, breast, colorectal, Prostate, stomach cancers..

- Leading cause of cancer deaths:

Lung, colorectal, liver, breast, stomach cancers..

The incidence of various cancers is increasing globally, and predicted to be 77% increase by 2050. why??

- Aging , Accurate diagnosis, Aggravate smoking, alcohol and obesity, exposure to risk factors, with air pollution..

The "Westernization" trends of CA:

- *↓ in cervix uteri and stomach CA incidence,*
- *↑ of breast, prostate and colorectal cancers CA rates.*

As a result of ;

- *↓ in infection-related cancers and,*
- *↑ in reproductive, dietary and hormonal related CA.*

- *Lung cancer re-emerge as predominant CA related to persistent tobacco in Asia.. While stomach Ca decreased in developed countries ….*

Global impact of cancer

- **Lung cancer: is** the 1st world cancer incidence (12,4%), and (1st Death, 19.% of the total death)

  55% in the developing countries. ***WHY?***
- **Breast cancer** 2nd (11.6%) of all CA incidence. Commonest cancer in women of 85% of the world countries (***USA***). It is the 4th leading CA death. ***WHY?***
- **CA Cervix:** is 8th most common cancer in women worldwide, 9th leading CA deaths. 88% of cases in developing areas (Africa) Low SES. ***Why?***?

- ***WHO Cervical Cancer Elimination Initiative..***

Global impact of cancer

Stomach cancer:

- The 5th most common malignancy in the world,
- >70% of cases in Eastern Asia (Japan, China). ·
- The decline of stomach cancer in industrialized countries is linked to;

improved food preservation practices; richer in vitamins from fresh vegetables and fruits; less consumption of preserved, cured and salted foods. Control Infection with H-pylori,

- Screening by photofluoroscopy has been widespread in Japan.
- Mortality rates are declining. ***WHY??***

Global impact of cancer

- ***Generally, cancer rates are highest in countries whose populations have the highest life expectancy, education level, and high income. Why??***

- ***China*** has the highest Breast CA incidence and mortality. ***WHY??***

Geographic variations in cancer incidence globally .. WHY??

- *Differences in prevalence of the underlying causes; environmental, cultural and ethnic (food habits, lifestyle).*
- *Differences in diagnostic criteria and healthcare systems and Rx options, prevention and education and researches .*
- *Differences in screening. (detection and reporting of cases)*
- *genetic factors .*

Impact of cancer in EMR…

In all 22 countries

- *Incident cases increased by 46%, Deaths by 33%.*
- *Iraq have the 3rd highest CA Incidence and mortality rates, after Lebanon and Afghanistan.*
- ***For females the commonest CA; Breast CA ..***
- ***For males the commonest CA; (TBL) …***
- ***The leading causes of CA deaths in females were breast cancer.***
- ***The leading causes of CA deaths in males were TBL,***

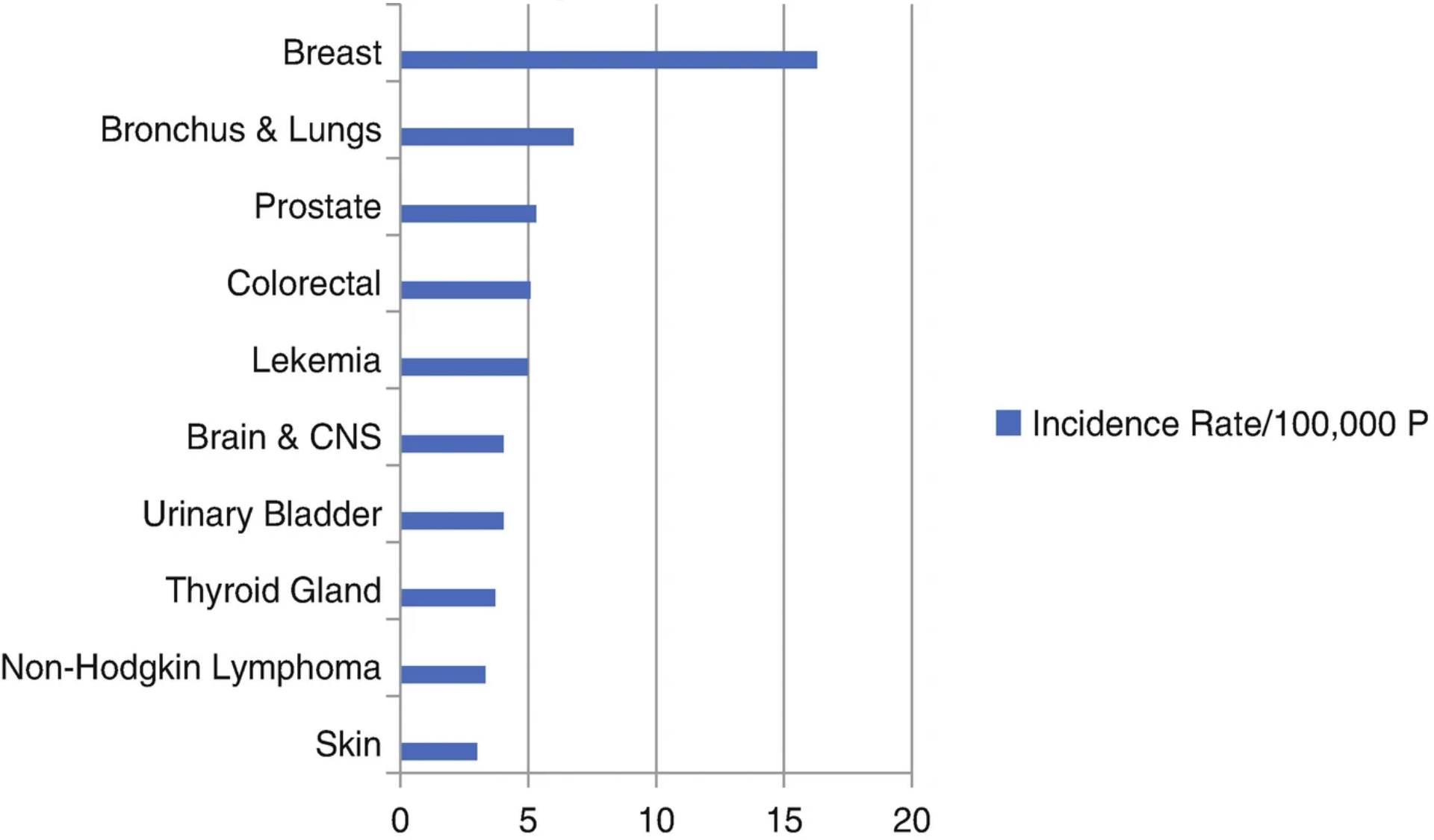
EMR

- It has been estimated that the highest incidence of cancer within the coming 15 years will be registered in the Eastern Mediterranean Region (EMR) … WHY??

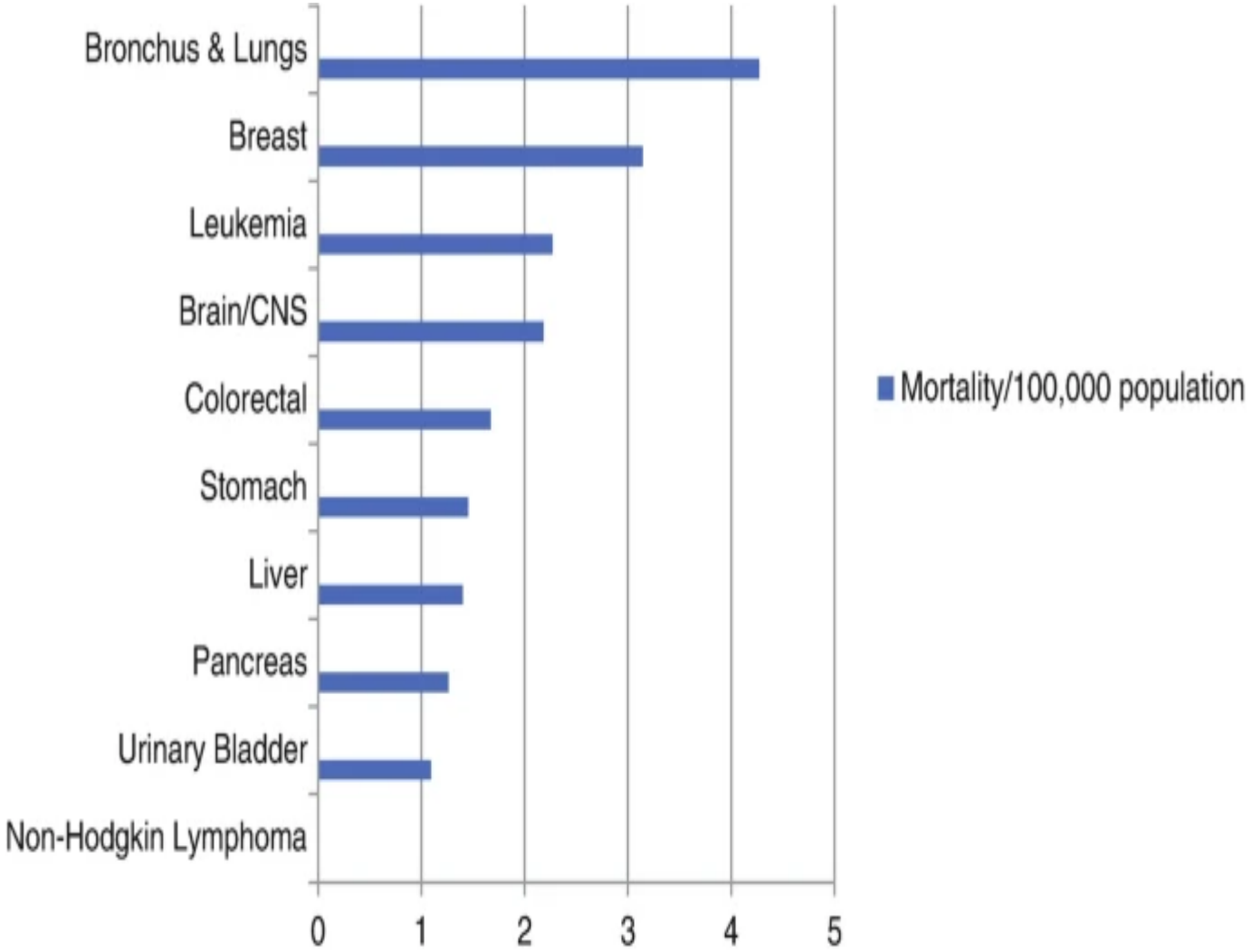
IMPACT OF CANCER IN IRAQ

- The CA rates, increased from 44.5 to 82.6/100,000, from 2008-2018.
- Breast cancer is the predominant CA. (female to male ratio 29:1).
- Then Lung cancer, (male to female ratio 3:1).
- All other CA, showed an accelerated increase after 2007.
- while the trend of cervical cancer went down. WHY??.
- Males >45 years affected 3 times more than female's.
- The Middle region of Iraq showed the highest trend followed by the South and then the North.

Incidence rate/100,000 population of the top ten cancers in Iraq, IRC, 2019



Mortality rates: top ten cancers in Iraq/100,000 populations, ICR, 2018



Causes of Cancer ??

- Major risk factors have been identified for a small number of cancers only and far more research is needed in that direction.
- Cancer has a multifactorial aetiology …

- Environmental factors are generally held responsible for 80 to 90% of CA

Determinants of Cancer

- **Environmental factors:** pesticides, air& water Pollution, sun light & radiation, occupational exposures (1-5% of all cancers).
- **Lifestyle factors: Tobacco** (lung, larynx, mouth, pharynx, oesophagus, bladder, pancreas and kidney). **Alcohol** (Excessive intake :oesophageal and liver, rectal CA). **Diet** ***(Smoked food ?, beef consumption ?, a high fat diet ?. Additives??)***, *Medications (e.g., oestrogen),* ***Obesity***, **physical inactivity**.
- **Biological factors:** Age, sex, genetic predisposition, family history.

GENETIC FACTORS: More difficult to identify. Suspected in:

- *Retinoblastoma occurs in children of the same parent.*
- *Mongols are more likely to develop Leukaemia.*
- *Mother or sister with a bilateral premenopausal breast CA.*

- **Socio-cultural factors:** Health-seeking behavior, screening uptake, cultural practices.

Other Breast cancer risk factors

- Hormonal , AGE AT MENARCHE AND MENOPAUSE,
- parity (unmarried, Nilliparous, Breast feeding, Late child bearing: >30 years
- Breast density (firm)

In addition to …..

- Obesity after menopause
- Genetic alterations: BRCA1, BRCA2 genes
- Family history
- Prior breast biopsy
- Physical inactivity & high fat diet
- Others ……

Carcinogenesis

- **Chemical carcinogens:** Tobacco smoke, aflatoxins, industrial chemicals.
- **Physical carcinogens:** Radiation (UV, ionizing).
- **Biological carcinogens:** Viruses (HPV, HBV, EBV), bacteria (H. pylori).

Infection and Cancer

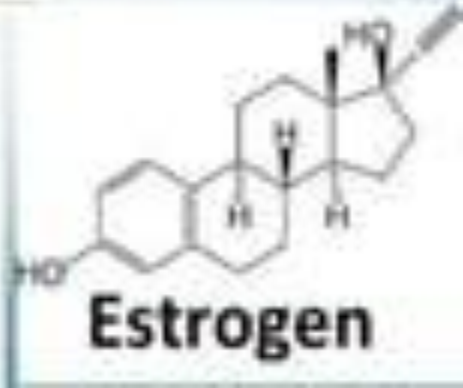
- It has been estimated that AR of all cancers worldwide to infections is about 18%.
- Schistosomal infestations → bladder cancer,
- Hepatitis viruses → hepatocellular carcinoma (HCC),

  - HBV vaccination ↓ the incidence of HCC by 70% in high prevalence regions.
- HPVs → cervical and Oropharyngeal cancer. ***(Vaccination??)***
- Epstein-Barr virus (EBV) → Burkitt lymphoma & nasopharyngeal CA.
- AIDs → Kaposi's sarcoma. Non-Hodgkin's lymphoma
- Helicobacter pylori→ stomach cancer.
- CMV → classical Kaposi's sarcoma..
- *By reducing the effects of these infectious agents **(HOW?)**:*

  - cancer incidence decrease by 8% in developed countries,

  - 26% in developing countries.

What causes Cancer ?



The best cancer-fighting foods

- Apples.
- Berries.
- Cruciferous vegetables.
- Carrots.
- Tomato,
- Garlic & onion
- Green leafs.
- Fatty fish.
- Walnuts.
- Legumes.

What are some warning signs and symptoms of cancer?

The American Cancer Society developed this simple reminder:

- ***C:** Change in bowel or bladder habits*
- ***A:** A sore that does not heal*
- ***U:** Unusual bleeding or discharge*
- ***T:** Thickening or lump in the breast or elsewhere*
- ***I:** Indigestion or difficulty in swallowing*
- ***O:** Obvious change in a wart or mole*
- ***N:** Nagging cough or hoarseness*

In addition to fever, fatigue, or Wt. loss

Control of cancer: is CA preventable disease??

1- PRIMARY PREVENTION:

A- **Control of tobacco and alcohol consumption :**

↓>1 million cancers/ year.

B- Avoid; HPV infection, Radiation, occupational carcinogens, air pollution, ***vaccination, supplementation ??***

C- Foods, drugs and cosmetics: Should be tested for carcinogens.

D- **TREATMENT OF PRECANCEROUS LESIONS**: as cervical tears, intestinal polyposis, warts, chronic gastritis, chronic cervicitis, polyps)

E- **LEGISLATION**: as legislation to control known environmental carcinogens (e.g., tobacco, alcohol, air pollution)

F- **CANCER EDUCATION**: "Warning signs"…

D- Awareness of individuals to The 10 commandments of cancer prevention.

The 10 commandments of cancer prevention are:

1. ***Avoid tobacco***
2. ***Avoid Alcohol***
3. ***Eat properly, enough water***
4. ***Exercise regularly:***
5. ***Stay lean and slim***
6. ***Avoid exposure to radiation & UV.***
7. ***Avoid exposure to industrial and environmental toxins***
8. ***Avoid infections that contribute to cancer*.**
9. ***Sleep properly in appropriate time*.**
10. ***Enough vitamin D***

2- SECONDARY PREVENTION:

A. Cancer registration: is a sine qua non for any cancer control program. (to assess magnitude, for planning the services). *Hospital-based and Population based registries.*

B. Early detection: by - “Cancer screening” , ***purpose??***

- ***How can increase the efficacy of screening program??***

- ***“***Early clinical diagnosis” .. (annual check up).

c. Treatment: Surgical, OR Chemotherapy, OR Radiotherapy, OR All…. ***“***

Freedom from cancer pain"

Is CA screening possible?? WHY??

(a) May preceded by a **premalignant lesion**.

(b) Most cancers begin **as localized lesions**, with a high cure rate if removed.

(c) 75 % of cancers occur in **accessible body sites.**

Screening methods

Cervical Cancer

- Pap smear
- Liquid based cytology
- HVP DNA testing
- Visual screening

Colorectal cancer

- Faecal occult blood tests (FOBT)
- Sigmoidoscopy
- Colonoscopy

Breast cancer

- Mammography
- Clinical breast examination

Oral cancer

- Visual inspection

Evaluation of cancer screening programs:

The best indicator is a change in

- Mortality rates… (survivor rate)
- Incidence rates?

If incidence of the cancer would increase faster than death rate ??

- Over diagnosis … DR ↓ or not change

If incidence increase, with increase DR??

- Increase exposure to risk factors

If death rates drop faster than incidence ??

May reflect improved treatments.

Early detection approaches

1. ***Screening***:

Objective of screening

- To achieve early detection and Rx of the disease.
- Reduction of mortality among the persons screened.

2. Early clinical diagnosis: Searching for pre-cancer or early invasive cancer in symptomatic or asymptomatic individuals in health care setting. By **Improving access** to health services promote early clinical diagnosis (annual check up).

“National Program for Early Detection of Breast Cancer” in Iraq

- Four main specialized referral training centers.
- Specialized clinics in the major hospitals.

The main objectives of the program:

1- Early detection of breast cancer,

2- Reduction in cancer-related morbidity and mortality,

3- Public promotion of cancer prevention and control

- Although, Bodies are constantly producing new cells, some of which have damaged DNA.

Does everyone get cancer?

Indicator of cancer prognosis

The relationship of incidence to mortality …

- ***Incidence/mortality ratio (IMR)*** *being indicative of an essentially fatal condition.*
- ***If low Inc. Mor. Ratio??***
- ***Most fatal, poor prognosis …. "Lung cancer"***
- ***If High Inc. Mor. Ratio… ??***

Better prognosis … Breast ca …

In Summary CA prevention are:

- Primary prevention: Avoid risk factors (quit smoking, healthy diet, vaccination against HPV/HBV).
- Secondary prevention: Screening (Pap smear, mammography, colonoscopy).
- Tertiary prevention: Treatment and rehabilitation to reduce morbidity and mortality.
- Policy measures: Tobacco control laws, occupational safety, public health campaigns.